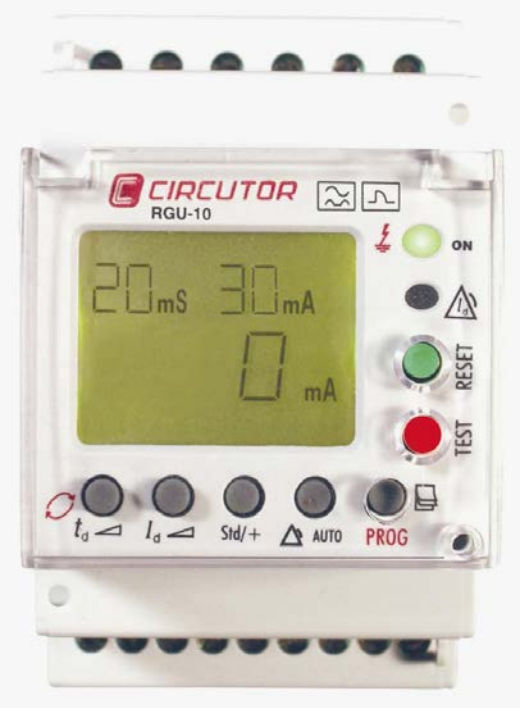
RGU – 10 / RGU – 10C

Electronic earth leakage protection relay



User manual
Extended version

M98203201_03_11A

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Checks on receipt.

This manual assists in the installation and use of the **RGU-10/RGU-10C** earth leakage relay so that the best possible use can be gained from it. Please check the following points on receipt of the relay:

- The equipment delivered matches your order specifications.
- Check that the equipment has not been damaged during delivery.
- Check that it has the correct instruction manual.

This manual contains information and warnings about the **RGU-10/RGU-10C** which must be followed to guarantee the proper operation of all instrument functions and to maintain it in a safe condition.
Installing and maintenance for this relay must be carried out by a qualified person.

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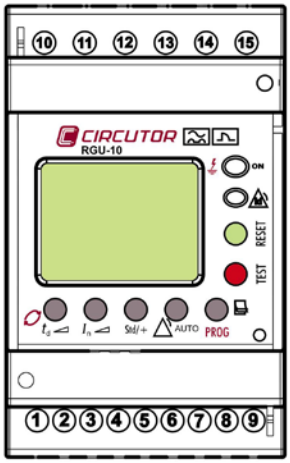
1.1.1.1.1.1.1 DIN RAIL PANEL (ADAPTER ACCESSORY)

SMALL 3 MODULE SIZE

INSTANT CURRENT LEAKAGE DISPLAY



BACKLIT LCD DISPLAY

GREEN Normal operation status.

RED Trip status by fault or other event.

PRE-ALARM RELAY

SENSITIVITY from 50 to 80%$I_{\Delta N}$

DELAY from 20 ms to 10 seconds

SETTING OF PARAMETERS

SENSITIVITY from 30 mA to 30 A

DELAY from 20 ms to 10 seconds

OUTPUT RELAY CONTACT STATUS

RS-485 MODBUS COMMUNICATIONS

ASSOCIATED BREAKING DEVICE

CONTACTOR. Connection by undervoltage coil

EARTH LEAKAGE DEVICE WITH TRIP COIL

1.1.1.1.1.1.1.1 TRIP COIL

· MINIMUM Voltage

ASSOCIATED MEASURING DEVICE

EARTH LEAKAGE TOROID. WG/WGS FAMILY

GENERAL FEATURES

The RGU-10 earth leakage relay is type A programmable electronic earth leakage protection equipment with two independent relays 4, the main output for checking the cut off device and performing the protection function and the pre-alarm relay for installation prevention and maintenance.

Allows the setting and adjustment of all parameters required for complete protection and maintenance checking in the installation. A series of parameters may be set directly from the keypad (buttons) and by setting menus on the instrument itself.

Before starting the earth leakage device carefully read sections: power supply, connection diagram and setting.

The RGU-10 measures, calculates and displays the earth leakage current in three-phase, balanced or unbalanced industrial systems.

Measurements are in true effective value, via one earth leakage current input, from the WG/WGS family external measuring toroid.

Under normal operating conditions the main values determining earth leakage protection in an installation are shown on the display. These include sensitivity, delay and instant current leakage.

Bearing in mind the high degree of protection required by installations, the equipment has a display and LED indicators for the different events which usually occur.

Data displayed or pre-alarm indication, trips, leakage readings, etc. assist in providing sufficient information for proper maintenance.

Under normal operating conditions the backlit display is green. However, after any event causing a main relay to trip, the backlight is red, indicating the reason.

The version for RS485 communications and appropriate software allows setting, data and information to centralised for the proper monitoring and checking of the maintenance of electricity lines.

The measurement of earth leakage current from which the RGU-10/RGU-10C operates by indicating the instant leakage current, pre-alarm or trip is determined by the WG series earth leakage transformers. The inner diameter of the transformer is defined by the installation's wiring dimensions.

EARTH LEAKAGE TRANSFORMERS, WG SERIES

Weight (g)	Useful diameter (mm)	Type	Code
76	20 ø	WGS-20	P10131
95	30 ø	WGS-30	P10132
181	35 ø	WG-35	P10111
274	70 ø	WG-70	P10112
545	105 ø	WG-105	P10113
1.222	140 ø	WG-140	P10114
2.040	210 ø	WG-210	P10115
2.400	70x175	WG-70 x 175	P10116
5.450	115x305	WG-115 x 305	P10117
7.400	150x350	WG-150 x 350	P10118
13.400	200x500	WG-200 x 500	P10119

MAIN FEATURES

- Measuring in true effective value (TRMS)
- Type A differential. IEC 61008.1
- Insulation against transients. IEC 61008.1
- High frequency filtering. IEC 61008.1
- Trip setting between 80 and 100% $I_{\Delta N}$
- Inverse curve. IEC 61008.1
- Associated standard IEC 61008.1, IEC 38

Other features:

- 3 modules. DIN rail. In a panel using front accessory, code M5ZZF1
- Displaying instant leakage values.
- Backlit LCD display.
- Built-in RS485 communications (Modbus RTU®). RGU-10C only

Available models:

RGU-10 SERIES	CODE
RGU-10	P11941
RGU-10C	P11944

INSTALLATION AND START-UP

This manual contains information and warnings about the RGU-10/RGU-10C which must be followed to guarantee the proper operation of all instrument functions and to maintain it in a safe condition. The equipment must not be switched on until it is finally connected to the electrical board.

IF THE EQUIPMENT IS HANDLED IN A WAY NOT SPECIFIED BY THE MANUFACTURER, THE EQUIPMENT'S PROTECTION MAY BE COMPROMISED

When it is likely that the equipment has lost its protection (i.e. with visible damage), it must be disconnected from the auxiliary supply. In this event, contact a qualified technical service representative.

INSTALLING THE EQUIPMENT

Check the following points before switching the equipment on:

- Power supply voltage.
- Operating conditions.
- Safety.

A. Power supply voltage:

- *Standard version*:

- Power supply	:	230 V_{ac} ± 20%
- Frequency	:	50-60 Hz
- Terminals 10-11	:	A1-A2
- Burden:		6 VA

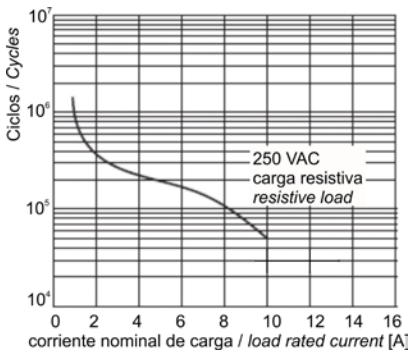
- *Special Version*:

- Power supply	:	24...230 V_{ac} // 400 V_{ac} // 12...230 V_{dc}
- Frequency	:	50-60 Hz
- Terminals 10-11	:	A1-A2

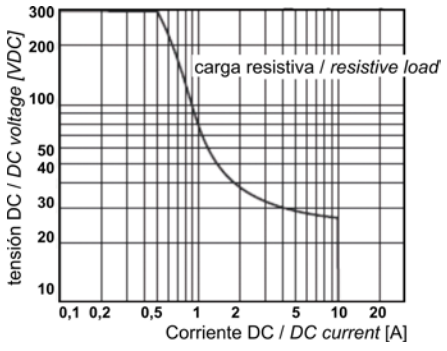
B. Main/pre-alarm relay output switch contacts:

- Main output terminal contacts	:	13-14-15
- NA output terminal	:	13
- NC output terminal	:	14
- Output common terminal	:	15
- Pre-alarm output terminal contacts	:	4-5-6
- NA output terminal	:	6
- NC output terminal	:	5
- Output common terminal	:	4
- Material	:	AgCdO
- Rated current/Maximum instant current	:	6 / 10 A_{ac}
- Rated voltage/Maximum switching voltage	:	230 V_{ac}
- Rated load in AC	:	2,500 V·A
- Contacts protected by varistor	:	275 V_{ac}
- Mechanical useful life	:	$10 \cdot 10^6$
- Ambient temperature range	:	- 40…+85 ºC

- Electrical useful life for AC loads



Cut off power for DC loads



C. External input for Trip/Rearm:

- Terminals : 1 – 2
- Type of input : Optocoupled
- Maximum voltage / Maximum power : 110 – 230 V_{ac} ± 20% / 0.7 W

D. Earth leakage current measurement circuit

Scale range	Full scale	Resolution display
30 mA	75 mA	± 1 mA
300 mA	750 mA	± 1 mA
3 A	7.5 A	± 0.1 A
30 A	75 A	± 1 A

E. Operating conditions:

- Operating temperature : -10 ºC / +50ºC
- Relative humidity : 5 to 95 % RH (without condensation)
- Altitude : up to 2,000 metres

F. Safety:

- Designed for category III installations, 300 Vac (EN 61010).
- Protection against electric shock by class II double insulation.

INSTALLATION AND MOUNTING

The equipment is installed on a DIN rail or on a panel (*drilled panel 67^{+1} x 67^{+1}mm, according to DIN 43 700 using accessory M5ZZF1*). All connections must remain inside the electrical board.

> Note that when the instrument is switched on, the terminals may be dangerous when touched and opening or removing parts may access dangerous areas. Therefore, the equipment must not be used until it is properly installed.

A 72x72 mm front adapter accessory is used to install the equipment on a panel. All connections must remain inside the electrical board.

The front adapter accessory has a base, a frame two tabs and three screws.

1. The base is mounted on top of the equipment.
2. The equipment is attached by screwing the holes in the equipment on the upper right corner and lower left corner on the front of equipment.
3. The front frame is attached to cover the mounting points.
4. Three green pressure tabs on the side runners of the base are attached.
5. The equipment is mounted in the hole in the panel with the adapter.
6. The tabs run towards the panel to obtain the mounting pressure.

Connection diagram features

The connection for the equipment using 0.5 mm^2 diameter cable.
Recommended tightening torque is 0.5-0.6 Nm.
Length of cable to strip 5-7 mm.

It is recommended that meshed cable is used to connect the toroid over large distances.

Terminal list

No.	Terminal description
1	Voltage input ON/OFF external L
2	Voltage input ON/OFF external N
3	
4	Output common contact pre-alarm
5	NC output contact pre-alarm
6	NA output contact pre-alarm
7	
8	Toroid current input 1S1
9	Toroid current input 1S2
10	Power supply voltage input A1
11	Power supply voltage input A2
12	
13	NA output contact trip
14	NC output contact trip
15	Output common contact trip

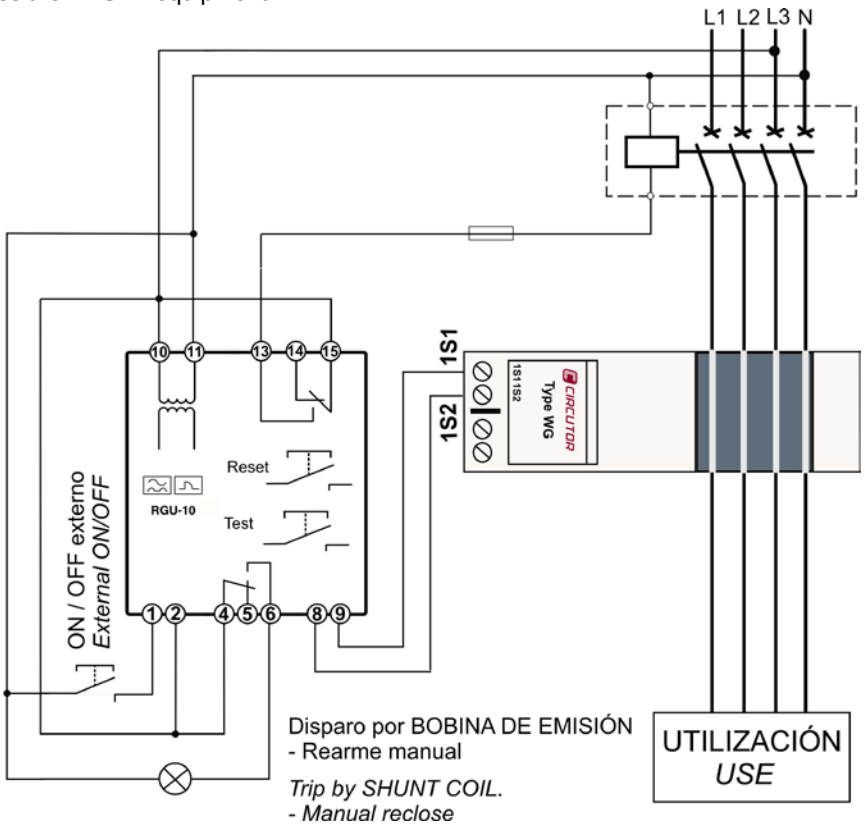
Note: Terminals 3, 7 and 12 are free.

CONNECTION DIAGRAMS

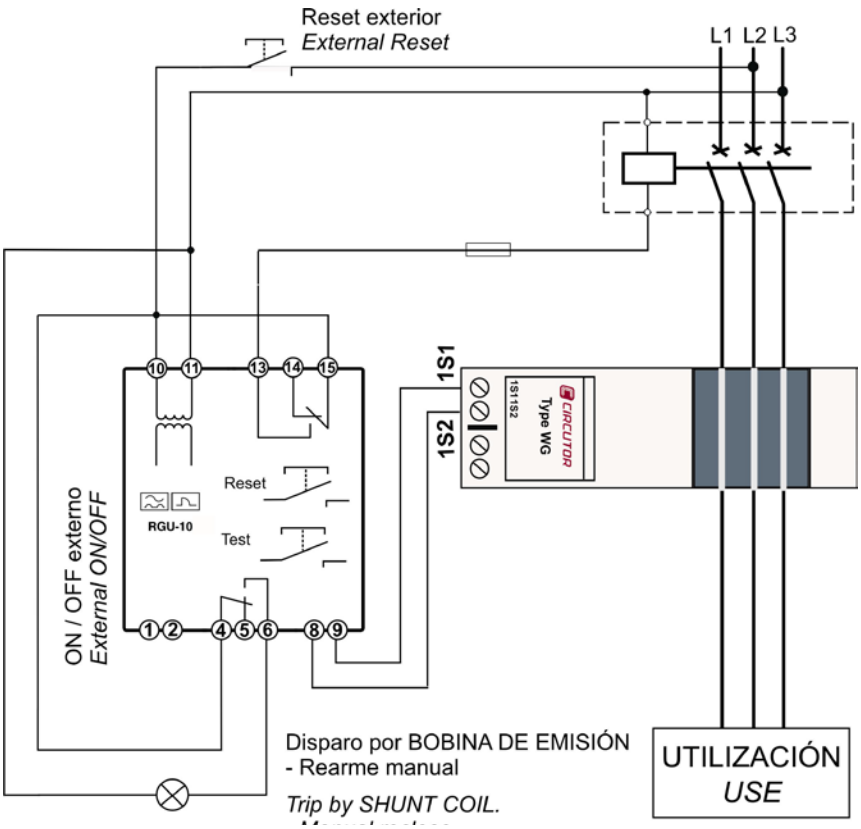
RGU-10/RGU-10C connection with current emission coil. In the event of powering the equipment before the breaking device (*AUTOMATIC SWITCH*) in an earth leakage trip situation because of a fault, test or toroid error:

1. Note the cause of the trip on the red display.
2. Reset the breaking device.
3. Press the RESET equipment.

Power supply from 24 to 230 V_{ac}

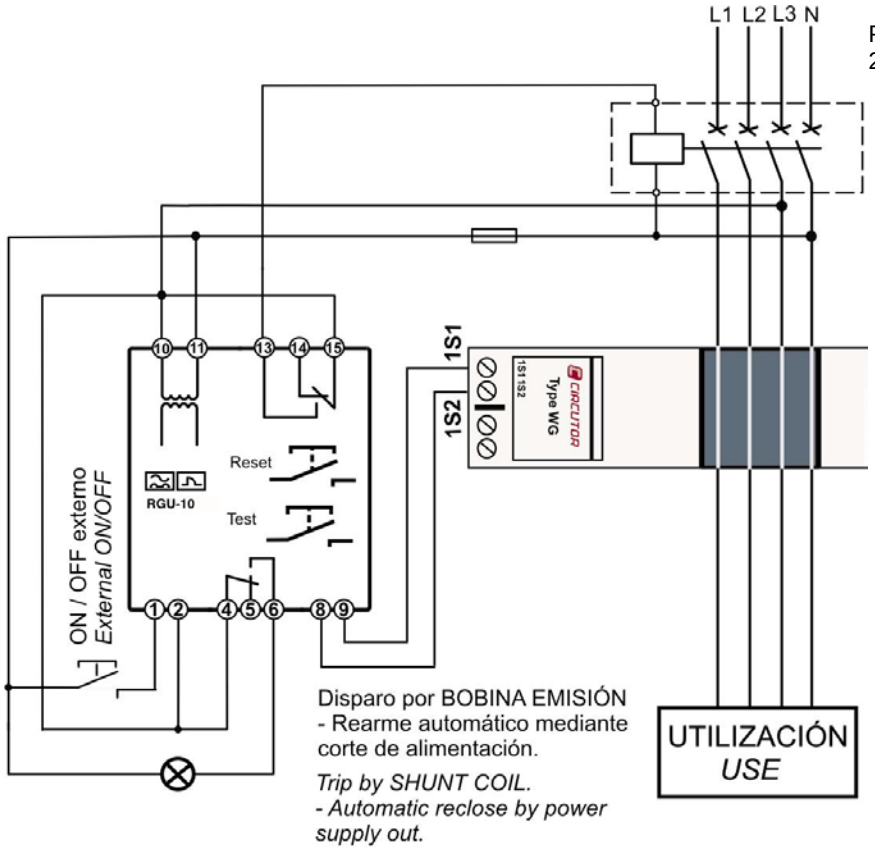


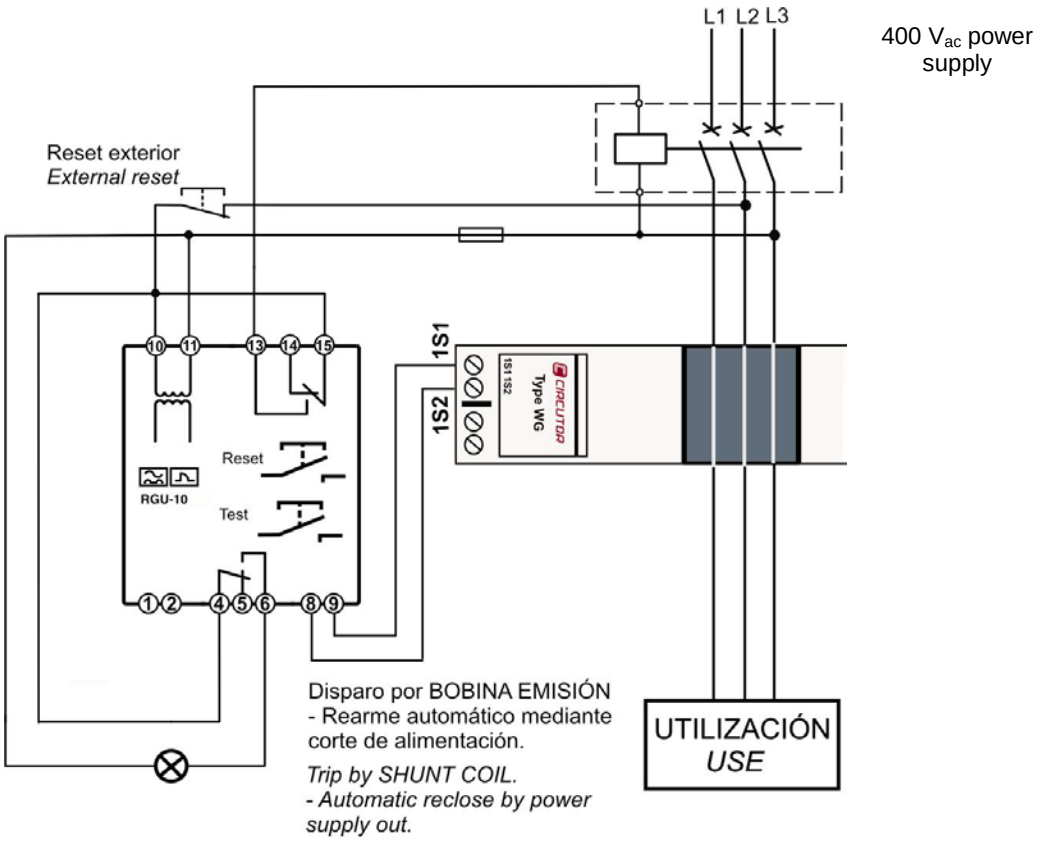
400 V_{ac} power supply



RGU-10/RGU-10C connection with current emission coil. The following has to be taken into consideration in the event of powering equipment after the breaking device.

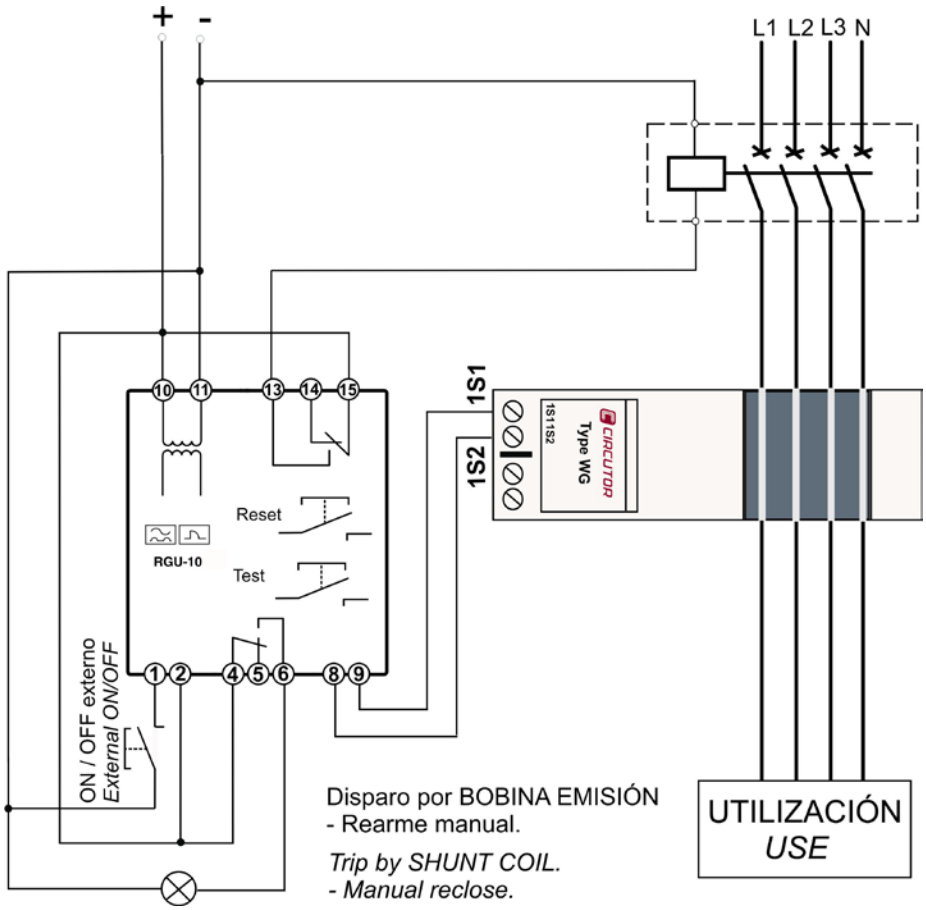
1. The breaking device has to be a manually resettable device.
2. After dripping, the equipment is disconnected losing all information on the reasons for the trip. The system is reset only by resetting the breaking device. It is reconnected by the power supply.





The equipment operates to its maximum whenever it is supplied from the installation itself before the breaking device or from an independent auxiliary power supply. However if the power supply from the installation is below the breaking device the system continues to be properly protected even though with limitations in terms of its disconnection performance through lack of power supply.

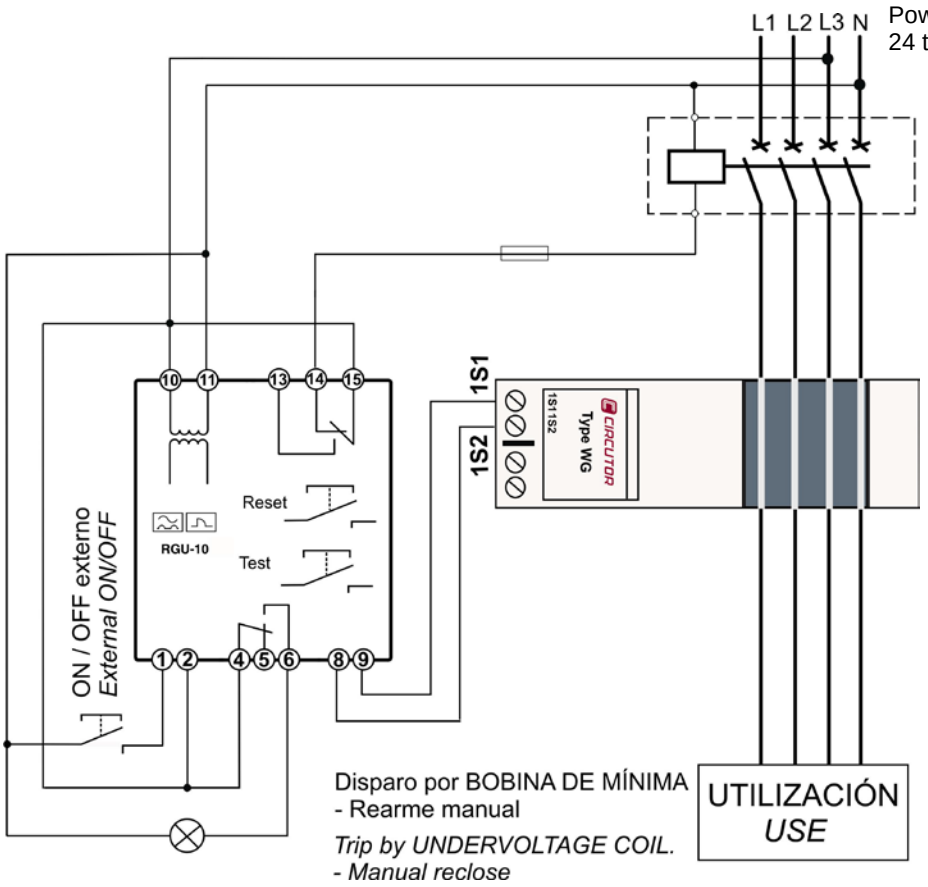
Others types of power supply voltages for the equipment, independent of the installation itself:

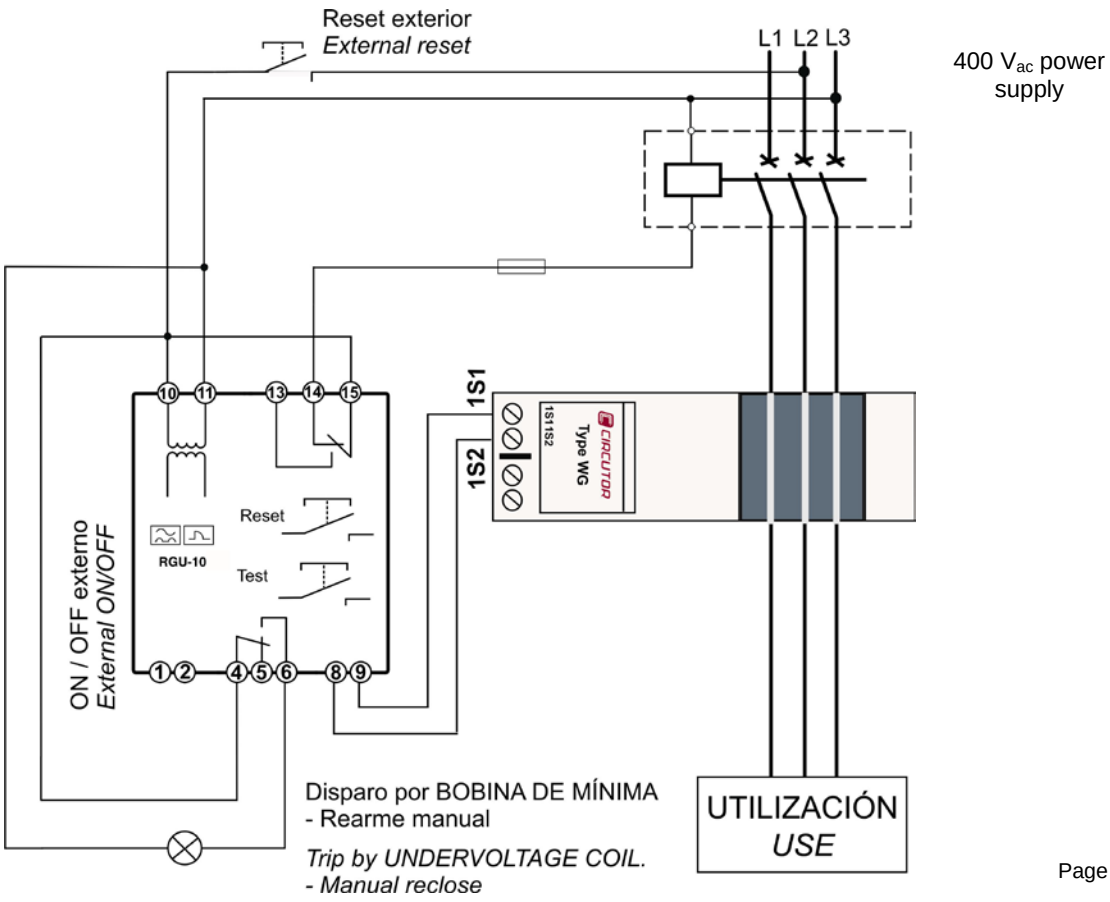


Power supply from 24 to 120 V_{dc}

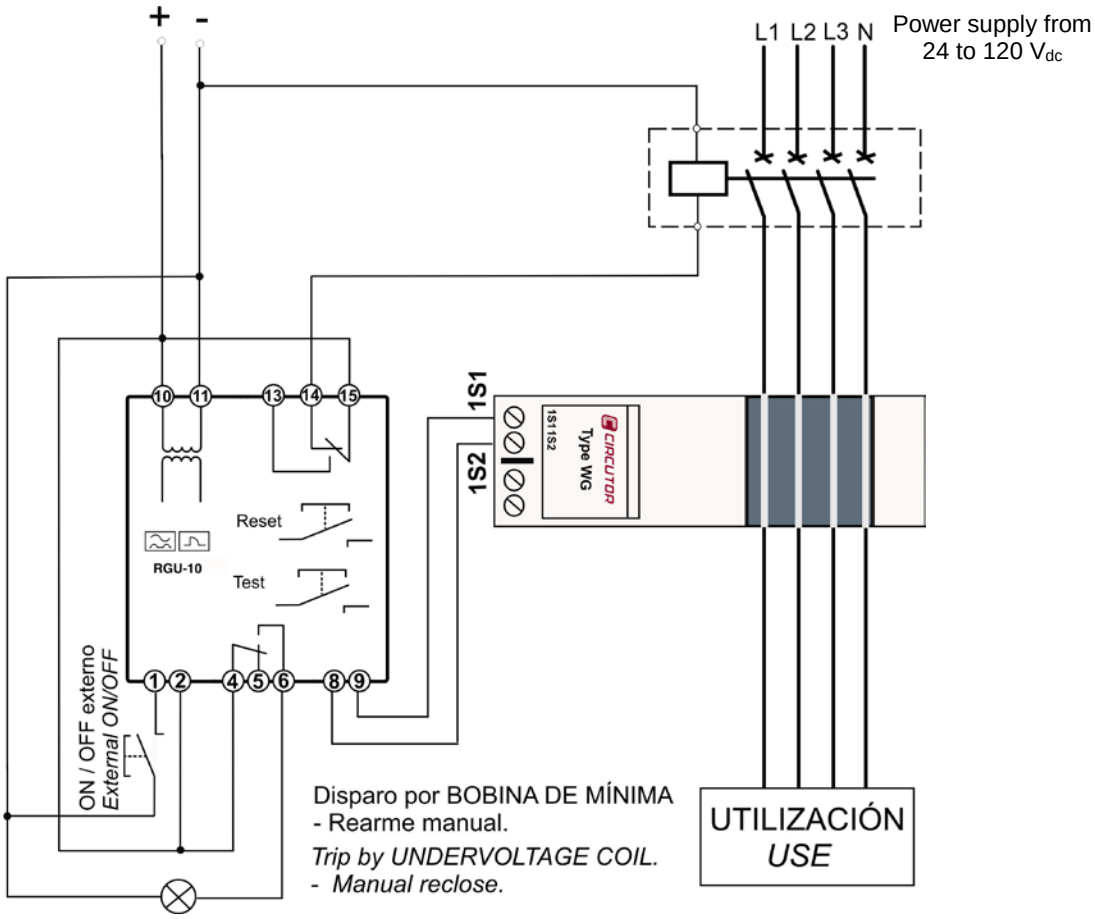
RGU-10/RGU-10C connection with undervoltage coil. Power supply to the equipment is before the breaking device. This breaking device may be an automatic switch or contactor.

Using a *CONTACTOR* the protection is reset by pressing RESET, or by using an *AUTOMATIC SWITCH*. The breaking device must be rearmed beforehand.





Other equipment's power supply voltages:

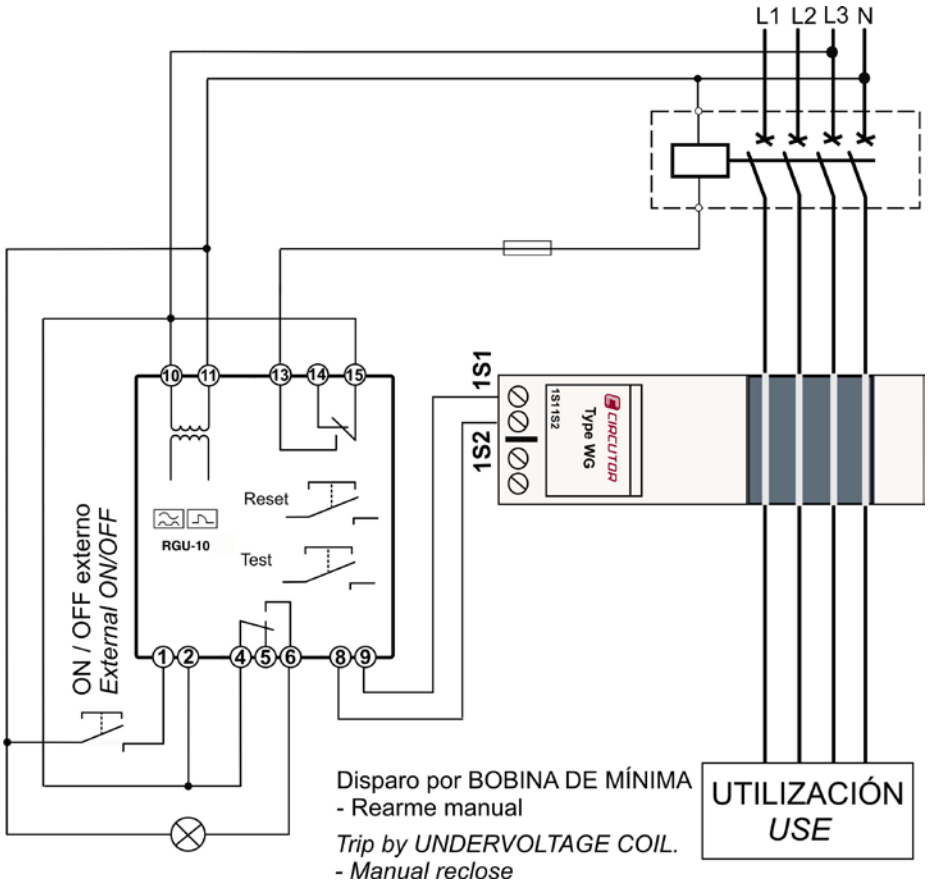


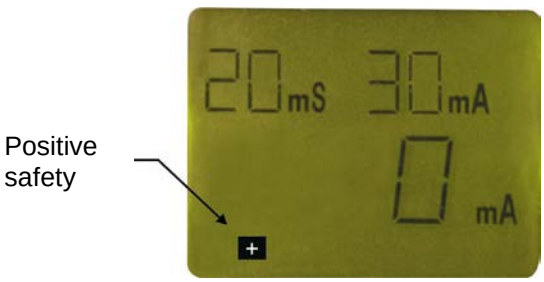
CONNECTING THE EQUIPMENT IN POSITIVE SAFETY

This installation mode provides the most conservative protection from the point of view of personal and property safety in electrical installations.

With this type of equipment connection and setting, persons all goods are protected against faults where the earth leakage relay loses its protection capacity. The last order from the relay is to open the installation in the event of this power supply problems to the equipment itself or through lack of voltage in the installation (neutral or face fault).

1. The breaking device has the power to trip using the undervoltage coil, either internally (*CONTACTOR*) or externally (*AUTOMATIC SWITCH*).
2. The equipment is set by programming by pressing the Std/+ key in positive safety mode. The "+"symbol appears on the display.
3. The equipment's power supply has to be the same as the installation or section it is protecting.

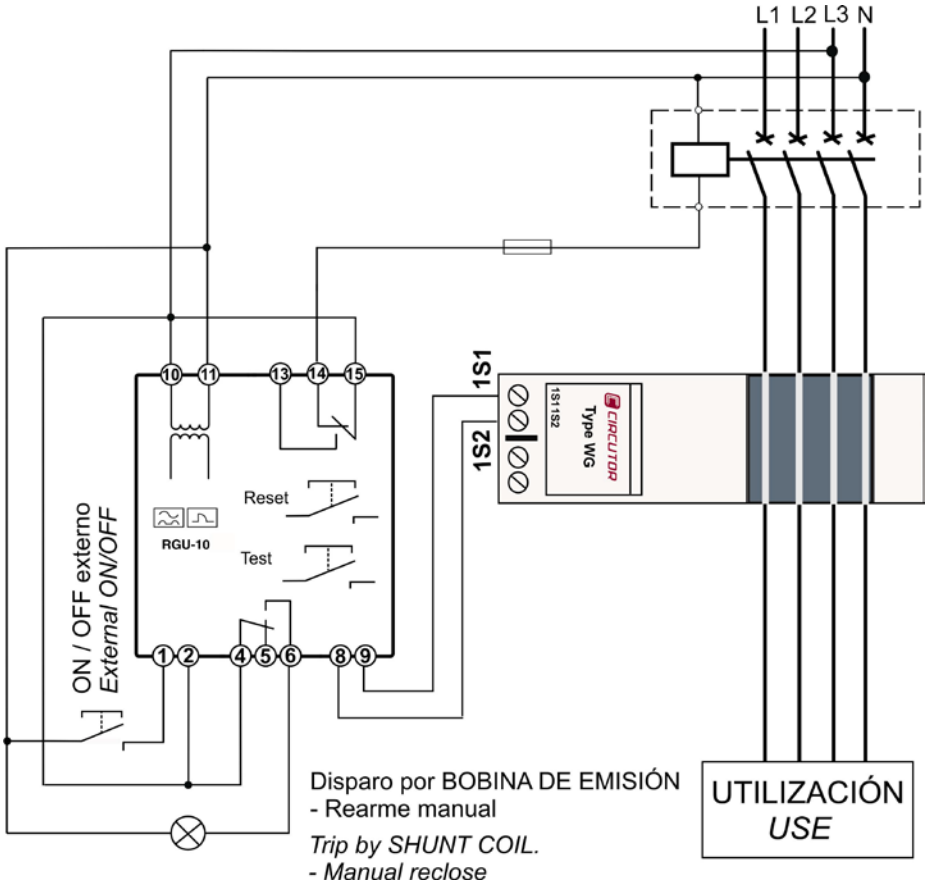


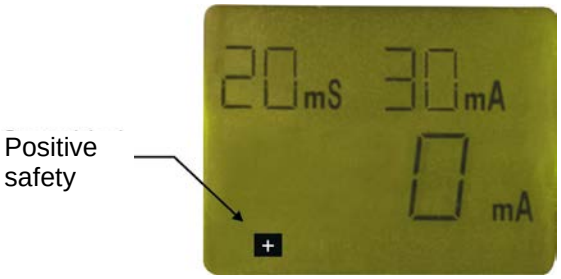


Positive safety

When this type of safety is used using the current emission coil, it can only be assured that the system will trip went the earth leakage relay is not operating correctly.

1. The breaking device has the power to trip using the maximum current coil. (*AUTOMATIC SWITCH*).
2. The equipment is set by programming by pressing the Std/+ key in positive safety mode. The "+"symbol appears on the display.

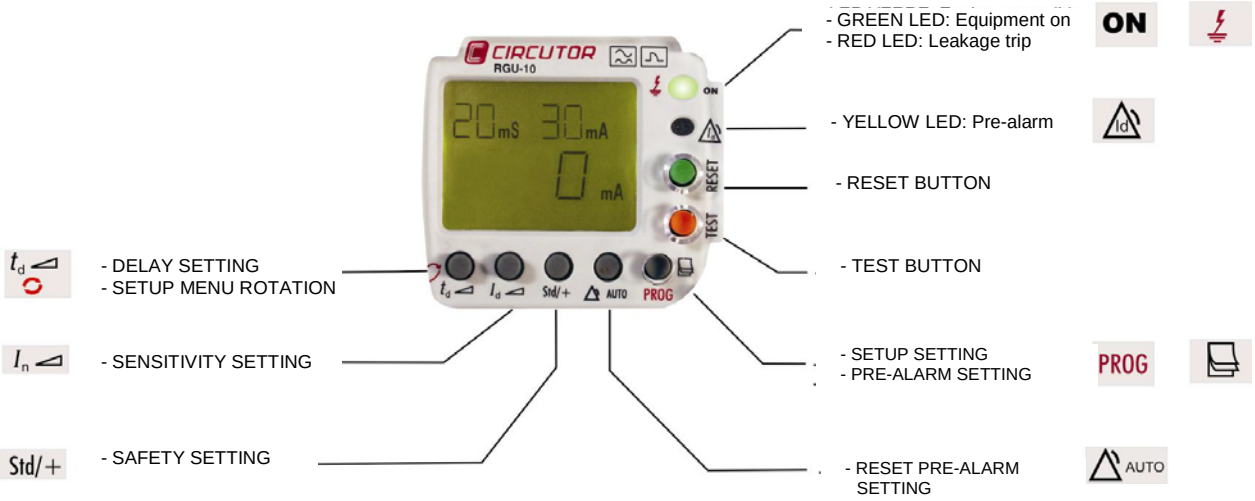




DESCRIPTION

The front of the equipment which is formed by the display, buttons and LEDs, is protected with a sealable plastic cover which has the appropriate holes to access the RESET, TEST and SETTING keys.

Generic functions of the LEDs and front keypad:



The equipment has to light indicators or LEDs.

Green / Red dual colour LED

- Off, the equipment is not operating or is not receiving power supply voltage.
- On in green, the equipment is operating. It is receiving power supply voltage.
- On in red, the equipment has tripped.

Yellow LED. Indication of pre-alarm

- Off, there is no pre-alarm trip.
- On, constant, pre-alarm trip without reclosing.
- On, flashing, pre-alarm trip in re-closing situation.

The equipment has seven buttons described according to the degree of accessibility.

Accessible with sealed cover and tool.

***RESET* button**

- Starts the equipment after a trip.

***TEST* button**

- Carries out a trip to check the proper operation of the relay.

***PROG/PAG* button**

- Dual purpose button.
- With a short press, the PRE-ALARM setting is entered.
- With a long press, the equipment's SETUP program is entered.

Accessible with cover raised. Keys with dual function. With a long press, the equipment is entered to set the values. With a short press, the option within a series of values defined in the equipment is selected.

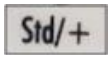
***SENSIVITY* button, $I_{\Delta N}$**

- This allows values between 30, 100, 300, 500 mA , 1 and 3 A to be selected
- This scale can be extended using the SETUP program to add 5, 10 and 30 A to the above values.

***DELAY* button, t_d**

- This allows 20, 100, 200, 300, 400, 500, 750 500 ms and 1 second to be selected.
- This scale can be extended using the SETUP program to add 3, 5 and 10 seconds to the above values.
- This person also allows browsing within the SET UP MENU.

Accessible with sealed cover and tool. Flush buttons.

***NORMAL OR POSITIVE SAFETY* button** 

- This allows the output contacts' polarity to be set for both the main relay and the pre-alarm.
- With normal safety (Std) the relay is activated with a fault, the status is NO.
- With positive safety (+) the relay is activated on supplying the equipment and is deactivated with the fault, the status is NC.

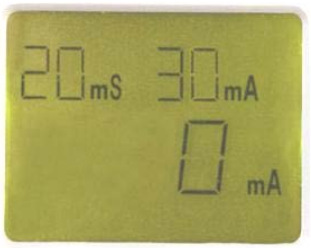
***ALARM RESET* button**

- This allows the automatic re-establishment of the pre-alarm signal to be enabled.
- In Automatic Mode (REC), if the detected leakage current is below the preset pre-alarm threshold, the relay becomes de-activated.
- In manual mode, the equipment has to be RESET from the alarm screen in order to re-establish the pre-alarm system.

The equipment displays and sets or these directly set parameters by direct setting or by programming the SETUP program from the display.

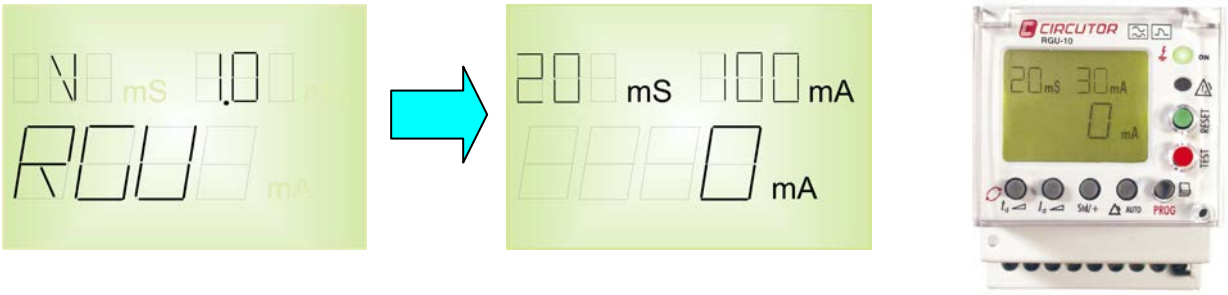
Backlit display, LCD

- The background to the screen in normal mode is green. The parameters required for earth leakage protection, sensitivity and delay in its associated units are displayed. It also displays the current leakage current.
- If the equipment trips through any event, the screen's background changes to red and the reason for the trip is displayed.



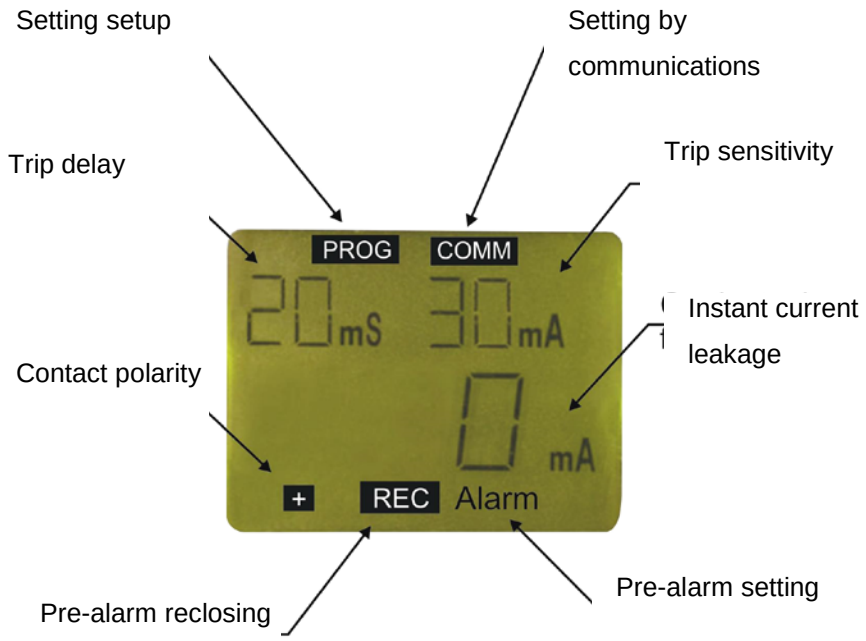
OPERATION

When the equipment is powered at its rated voltage, the green LED on the front is on, the backlit LCD is green indicating the software and hardware version. After a short while, the version disappears and the default display values appear on the display.



The display shows the delay and sensitivity settings as well as the instant leakage current reading.

While the equipment is operating, the display shows the following symbols while the equipment is being programmed and set.



In normal operating status the display shows the following parameters associated with the earth leakage protection.

PARAMETER	UNIT
Instant current leakage intensity	*mA / A*
Preset trip delay, t_d	*mS / S*
Sensitivity of trip preset, $I_d = I_{\Delta N}$	*mA / A*
Main relay contact status	*+ (contact 14-15 NA) / nothing (contact 14 - 15 NC)* *+ (contact 16-15 NC) / nothing (contact 16 - 15 NA)*

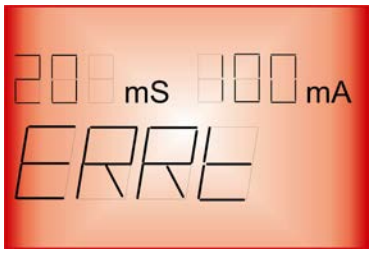
The RGU-10/ RG5-10C allow the display and setting of all required parameters to complete the earth leakage protection adjustment with pre-alarm and communications.

PARAMETER	UNIT
Preset pre-alarm trip delay	*mS / S*
Sensitivity of pre-alarm in % $I_{\Delta N}$	*%*
Pre-alarm relay contact status.	*+ (contact 6-5 NA) / nothing (contact 6 - 5 NC)* *+ (contact 4-5 NC) / nothing (contact 4 - 5 NA)*
Operating frequency (*)	*Hz*
Peripheral No. (*)	-
Baud rate (*)	*Bauds*
Type of parity (*)	-

(*) RGU-10C only

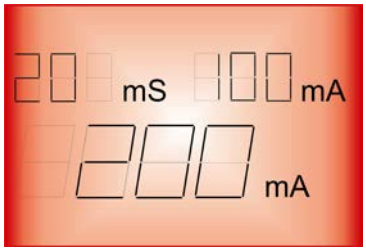
TROUBLESHOOTING OR REASONS FOR TRIPPING

POOR TOROID CONNECTION TRIP. After a certain time the equipment will carry out a test to detect the presence of the sensor or associated earth leakage transformer. If it does not detect either of the above, the LCD and LED will be red. Also the "**ERRt**" error message will permanently appear on the LCD. A short-circuit in the transformer secondary will also be detected as an error. When this error is detected, the correct connection with the earth leakage transformer has to be ensured and a RESET made to re-establish proper working. If the transformer is detected again, normal status is returned and the error message disappears.

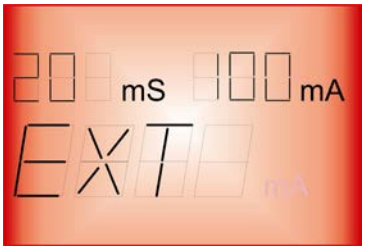


PRE-ALARM TRIP. In the event of the defaults current intensity exceeding the preset pre-alarm threshold, the yellow will come on, the green backlit LCD will show the leakage level and the pre-alarm output relay will be activated. In automatic mode (REC) when the pre-alarm situation is removed, normal status is resumed (LED and signal relay). In manual mode, the equipment has to be RESET to unblock the pre-alarm.

FAULT TRIP. When the equipment is tripped by a current fault, the red and yellow LED comes on and the backlit LCD is red. For current from the last cycle which tripped the relay is displayed. To reconnect press RESET to return to the initial status.



REMOTE TRIP. When a trip is forced (input terminals 1-2, by applying 230 V) the equipment is tripped and disabled and an "**EXT**" message is shown on the display in red and also the LED is on. It has to remain permanently in this situation until the change in status no longer exists. It is not possible to manually reset or reset using communications.



When it is remotely reset (input terminals 1-2, removing the 230 V) the equipment is reconnected with the display backlit in green, LED ON in green as in normal status.

For the RGU-10C, a remote trip/reset can also be made via RS485 communications. The equipment remains tripped showing this incidence on the display with a "**REM**" message in red with also the LED ON. It has to remain permanently in this situation until the change in status no longer exists.

It is reset when the remote reset is carried out using RS485 communications, applying 230 V between the remote 1-2 input terminals or by pressing the reset button. The equipment is reconnected with the display backlit in green, LED ON in green as in normal status.

TRIP MESSAGES ON THE EQUIPMENT

CAUSE OF TRIP	MESSAGE DISPLAY
TEST	**TESt**
Poor toroid connection	**ERRt**
Remote signal ON/OFF	**EXT**
RS485 Communications	**REM**
Current leakage	Instant value

OTHER DISPLAY MESSAGES

MESSAGE	
SAVE	Enters setting values
EXIT	Exits setting mode
OVR	Current leakage reading off scale

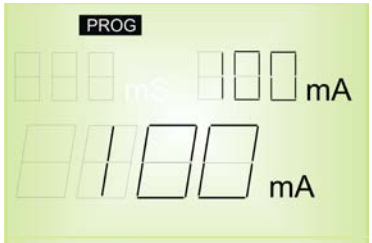
EQUIPMENT SETTING

Direct settings

By pressing for a long time on any of the direct setting buttons, **PROG** mode is entered (icon on LCD) and the relay's setting may be changed. While in **PROG** mode if any other direct function is used (I_d, t_d, Std/+ and Auto), the parameter for the displayed relay can also be set. **PROG** mode is exited if no buttons are pressed for a while with the last setting being, "SAVE".

Main relay current setting

Pressing I_d for more than one second, PROG appears and a setting from the list is increased with every press. The current setting is seen in small figures and the new setting in the main figures. 30 mA, 100 mA, 300 mA, 500 mA, 1 , 3, 5, 10, 30A. The scale is limited. This is changed in the equipment's SETUP. The default setting is a 3A scale is

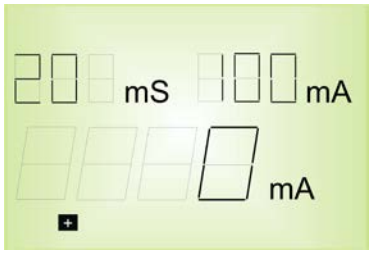


Time and Main relay curve setting

Pressing t_d for more than one second, PROG appears and a setting from the list including curve types is increased with every press. The current setting is seen in small figures and the new setting in the main figures. INS curve, SEL [S] curve, 20, 100, 200, 300, 400, 500, 750 ms, 1, 3, 5, 10s. The scale is limited. This is changed in the equipment's SETUP. The curves belong to the 1 s scale which is the default scale. If the setting for $I_{\Delta N}$ is 30 mA, only instant settings are permitted, 20 ms, Curves INS or SEL.

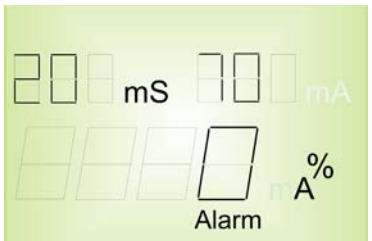
Main relay positive safety setting

"Std", contacts are on standby and are not shown on the display. 14 - 15 (NC) and 13 - 15 (NA).
"+" contacts change status on powering the equipment and are not shown on the display. 14 – 15 (NA) and 13 – 15 (NC).



Setup using the menu. Pre-alarm / SETUP

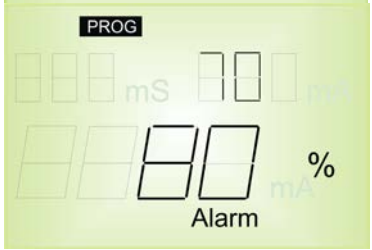
The PROG/PAGES buttons control the alarm relay and main relay settings using SETUP. If the button is pressed for a short time the pre-alarm setting is entered. "**Alarm**" appears on the LCD. Also the pre-alarm threshold appears as a % of the sensitivity setting and the pre-alarm delay. To exit press PROG.



Pre-alarm current setting

This is in terms of the program value in the main relay. Pressing I_d enters to change the values. Relative values are shown as a % of the preset trip current. Pressing I_d changes the values:
OFF - 50 - 60 - 70 - 80 - MAIN

OFF → pre-alarm disabled
MAIN → the pre-alarm continues to trip the main channel.

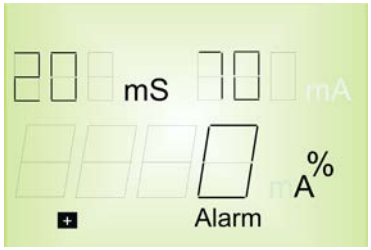


Pre-alarm time setting

This is in terms of the program value in the main relay. Pressing t_d enters to change the values. Pressing t_d changes the values:

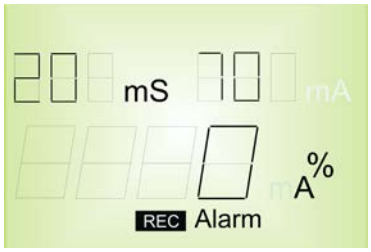
20, 50, 75, 100, 300, 500, 750 ms, 1, 3, 5 and 10 seconds

Pre-alarm positive safety setting



"Std", contacts are on standby and are not shown on the display. 4 - 5 (NC) and 6 - 5 (NA).
"+" contacts change status on powering the equipment and are not shown on the display. 4 – 5 (NA) and 6 – 5 (NC).

Reset pre-alarm setting



In the pre-alarm menu the **REC** function is shown as disabled or enabled. **REC** appears on the LCD when it is enabled.

Setup using SETUP

"PROG" and the first menu option appear on the display by pressing a long time. Once in menu setting mode, the different text indicators appear on the display after each time PROG is pressed.

When the correct menu is reached, the parameter can be changed by pressing t_d *(rotating)*. In order to enter the settings press the PROG but on again with the "SAVE" message showing the version of the equipment. The display the turns to the initial screen.

If, after a certain time, the keyboard remains inactive the "**EXIT**" message appears and the main relay settings are shown without any information being saved.

Setting *COMMUNICATION SETUP**(Only for models with communication)*

One or more RGU-10C instruments may be connected to a computer or PLC in order to automate a production process or an energy control system. As well as the usual operation of each instrument, this system may centralize data at one single point; for this reason the RGU-10C has an RS-485 communication output.
If more than one instrument is connected to one single series line (RS-485), it is necessary to assign to each a number or address (from 1 to 99) so that the central computer or PLC sends the appropriate requests to these addresses for each peripheral.

From communication SETUP, the RGU-10C's communication parameters may be displayed and/or changed; this may match these parameters to the requirements of the system topologies and/or applications.

The equipment does not save the setting changes until all of the setting has been entered using the **PROG** button. When it detects that the keyboard has been inactive for a certain time it displays "**EXIT**" and the setting menu is exited it without saving the changes.

> ☞ To access **COMMUNICATIONS SETUP** the **PROG** button has to be pressed to enter setting mode.

On entering setting mode a screen is displayed showing that the equipment has entered communication setting mode.

To enter setting mode the **PROG** button must be pressed

Peripheral number

The display shows PERI and the peripheral number on the upper left of the screen.

To write or change the number of the peripheral repeatedly press the **td** button, increasing the value of the digit which is in the upper left corner.

When the required value is on the screen, it is entered and the display moves on to the next menu by pressing **PROG** button, to allow the remaining values to be changed.

The peripheral number varies between 1 and 99.

Baud rate

The display shows the letters "bd" on the upper left of the screen showing the bauds and shows the baud rate in units of a thousand in the central part of the screen.

Repeatedly press the **td** button to change the baud rate, increasing the value of a digits on the central area of the screen.

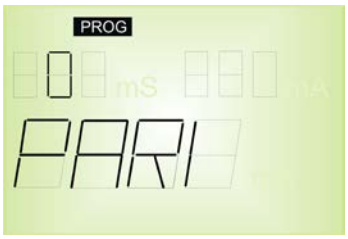
When the required value is on the screen, move on to the following digit by pressing **PROG**, to allow the remaining values to be changed.

The possible setting values are as follows:

Value on screen	Bauds
2.4	2400
4.8	4800
9.6	9600
19.2	19200
38.4	38400
54.6	54600
115	115000

Parity

The display shows "PARI" with the set a value on the upper left of the screen.



In order to change parity, repeatedly press the **td** key to change the values on the upper left of the screen.

When the required value is on the screen, it is entered and the display moves on the next screen by pressing **PROG**, to allow the setting to be changed.

For communication setting menu using SETUP ends on this screen. It directly links with the first measurement SETUP screen on the equipment.

Setting *measurement SETUP*

From measurement SETUP, the parameter settings for the RGU-10/RGU-10C can be displayed and/or changed; this may match these parameters to the requirements of the system topologies and/or applications. If it is an RGU-10C, this SETUP menu is preceded by the communications SETUP menu. If there is no communications, RGU-10 is the only SETUP on the equipment.

The equipment does not save the setting changes until all of the setting has been entered using the **PROG** button. When it detects that the keyboard has been inactive for a certain time it displays "**EXIT**" and the setting menu is exited it without saving the changes.

> ☞ To access **MEASUREMENT SETUP** the **PROG** button has to be pressed to enter setting mode.(*)

(*) RGU-10 only.

On entering setting mode, a screen is displayed informing that the equipment has entered setting mode with the PROG symbol on the upper section of the first menu screen.

Operating frequency

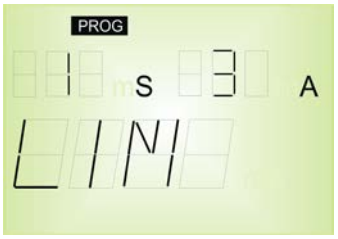
The display shows **FREQ**. In order to change this press **PROG**. The value of the current frequency appears on the upper left of the screen.

In order to change the operating frequency, repeatedly press the **td** button increase in the digit in the upper left corner.

When the value on the screen is the required value, enter and move onto the next menu by pressing the **PROG** key. SETUP is exited with the **SAVE** message.

Scale limit

The display shows **LIM**. In order to change this press **PROG**. The final delay scale values and the actual current sensitivity settings appear on the upper section of the screen.

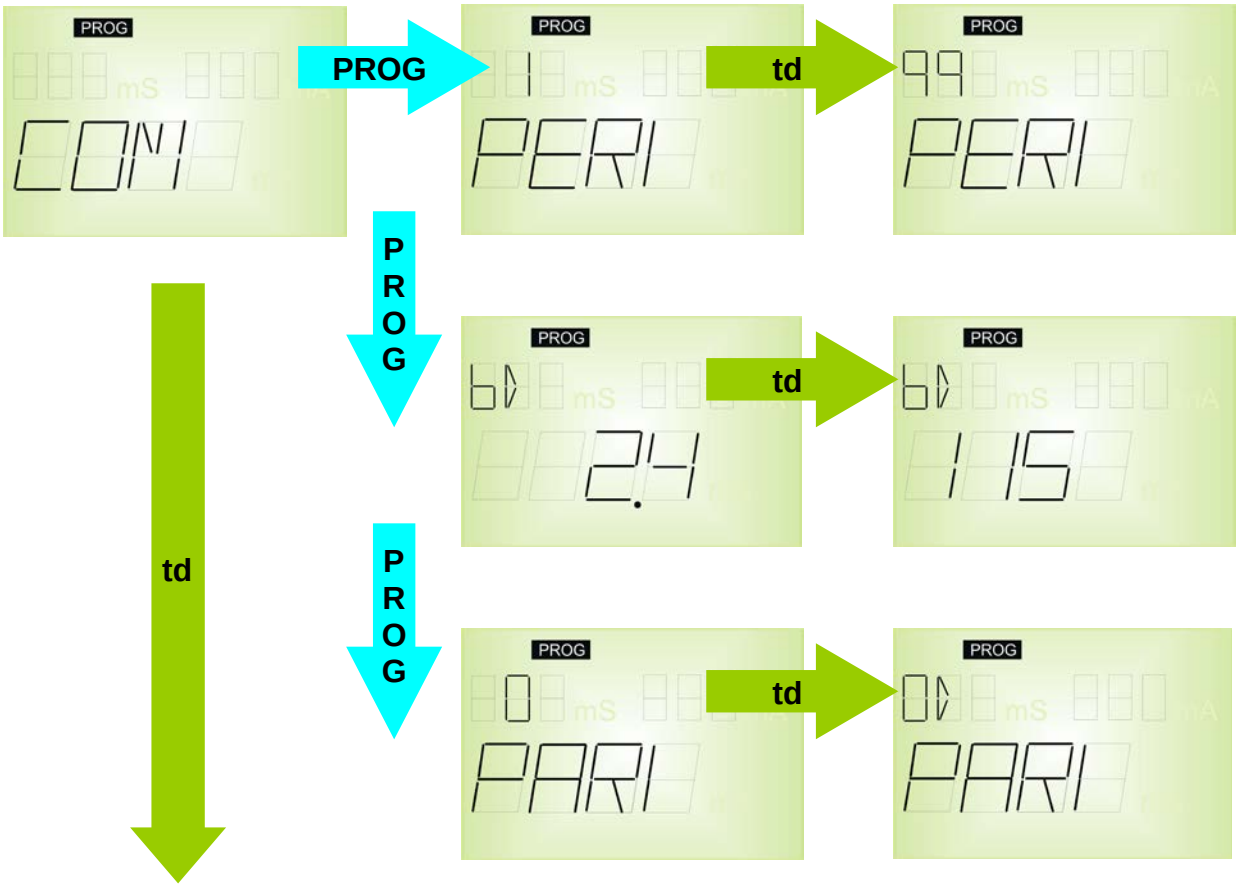


In order to modify the operational scale, repeatedly press the **td** button increasing the values of the digits on the upper section of the screen. There are two scales, one in 10 seconds and 30 Amperes and the other default scale in 1 second and 3 Amperes.

When the required values are shown on the screen they are entered by pressing the **PROG** button. SETUP is exited with the **SAVE** message.

Setting diagram using *SETUP*

THE RGU-10C (RGU-10 WITH COMMUNICATIONS) SHALL START SETTING USING SETUP WITH THE **COM** SUBMENU. THIS DOES NOT APPEAR ON THE RGU-10.



THE RGU-10 SHALL START SETTING USING SETUP WITH THE **FREQ** SUBMENU

MODBUS© protocol

The **RGU-10C** earth leakage communicates using the **MODBUS RTU©** protocol (*Pulling* Question / Answer).

In the MODBUS protocol the RTU (Remote terminal Unit) mode is used; each 8-bit byte in a message contains two 4-bits hexadecimal characters.

The format for each byte in RTU mode

Code	8 bits binary, hexadecimal 0-9, A-F 2 hexadecimal characters contained in each 8-bit field in the message.
Bits per byte	8 data bits
Field Check-Error	CRC Type (Cyclical Redundancy Check)

MODBUS functions used:

Function 04h	Reading
Function 10h	Writing

MODBUS© memory map

Parameter	*Symbol*	Values	Units	Address	Reading Writing
Peripheral No.	*1.1.1.1.1.1*	1 – 99	-	0000h	R/W
Baud rate	*bd*	2,400 - 4,800 - 9,600 - 19,200 38,400 - 57,600 - 115,200	bauds	0001h	R/W
Type of parity	*PARI*	None, Odd, Even	-	0002h	R/W
Operating frequency	*FREC*	50 – 60	Hz	0003h	R/W
Trip current Main relay	*Id*	0.03 - 0.1 - 0.3 - 0.5 - 1 3 - 5 - 10	Amperes	0004h	R/W
Delay time Main relay	*td*	INS – SEL – 0.02 – 0.1 – 0.3 – 0.4 – 0.5 0.75 – 1 – 3 – 5 – 10	seconds	0005h	R/W
Contact polarity Main relay	*Std/+*	Standard - Positive	-	0006h	R/W
Trip current Pre-alarm	*Id'*	OFF – 50 – 60 – 70 – 80	%	0007h	R/W
Delay time Pre-alarm	*td'*	0.02 – 0.1 – 0.2 – 0.3 – 0.4 – 0.5 – 0.75 1 – 3 – 5 – 10	seconds	0008h	R/W
Contact polarity Pre-alarm	*Std/+*	Standard - Positive	-	0009h	R/W
Pre-alarm reclosing	*REC*	Manual - REC	-	000Ah	R/W
Series No. (HI)	-	**1.1.1.1.1.1.1 18ADh - 188Ch**	-	000Bh	R
Series No. (LO)	-	0000h - FFFFh	-	000Ch	R
Equipment version	-	0 – 100	-	000Dh	R
Relay contacts status	-	Off - On (Main) On (pre-alarm)	-	0014h	R
Effective value Current leakage	-	0 – 65,000	mA	0015h	R
Effective value Trip current.	-	0 – 65.000	mA	0016h	R
Trip and external reset	-	0000h – Reset FFFFh - Test	-	0019h	W
Enable setting saving	-	0000h - Enable FFFFh - Save	-	001Ah	W

Example of MODBUS© reading

QUESTION
1.1.1.1.1.1.1.1 0A 04 00 00 00 0A 71 76

0A	Peripheral number, 10 in decimal
04	Reading function
00 00	Recording at which the reading is to start
00 0A	Number of recording to be read: 10 in decimal
71 76	CRC character

RESPONSE
1.1.1.1.1.1.1.2 0A 04 14 00 0A 00 02 00 00 00 32 00 00 00 01 00 00 00 01 00 14 00 00 7E C9

0A	Number of the peripheral that is responding, 10 in decimal		
04	Reading function- the one used in the question		
14	Number of bytes received *(20)*		
00 0A	0000h address:	*Peripheral number*	*(10)*
00 02	0001h address:	*Baud rate*	*(2- 9,600 bauds)*
00 00	0001h address:	*Type of parity*	*(0 - None)*
00 32	0003h address:	*Operating frequency*	*(50 Hz)*
00 00	0004h address:	*Preset trip current*	*(0-30mA)*
00 01	0005h address:	*Preset time for trip delay*	*(1-INS)*
00 00	0006h address:	*Relay output trip polarity*	*(0-Standard)*
00 01	0007h address:	*% I⊿N trip by pre-alarm.*	*(1-50%)*
00 14	0008h address:	*Preset time for pre-alarm delay*	*(1-20 ms)*
00 00	0009h address:	*Pre-alarm output relay polarity*	*(0-Standard)*
7E C9	CRC Character		

Example of MODBUS© writing

QUESTION
01 10 00 00 00 05 0A 00 01 00 03 00 00 00 3C 00 00 FF 64

01	Peripheral number (1)		
10	Modbus instruction number: multiple parameter writing (16)		
00 00	Initial recording of writing (0)		
00 05	Number of recordings to be changed (5)		
0A	Number of bytes to pass (10)		
00 01	0000h address:	*Equipment peripheral number.*	
00 03	0001h address:	*baud rate*	*(3 - 19,200 bauds)*
00 00	0002h address:	*type of preset parity*	*(0 -None)*
00 3C	0003h address:	*operating frequency*	*(3C - 60 Hz)*
00 1E	0004h address:	*trip current*	*(0 - 3030 mA)*
FF 64	CRC character		

RESPONSE

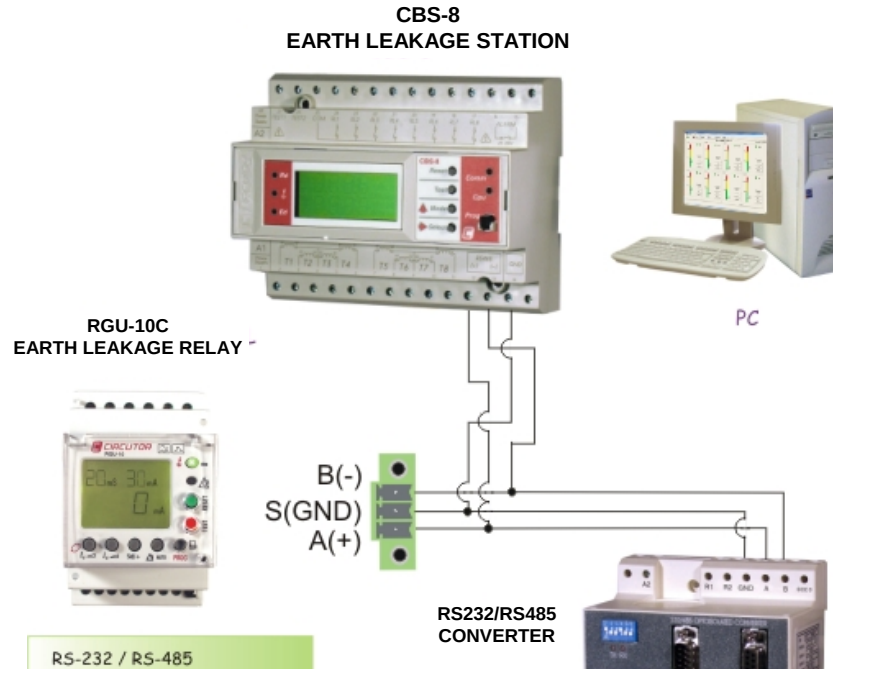
01 10 00 00 00 05 00 0A

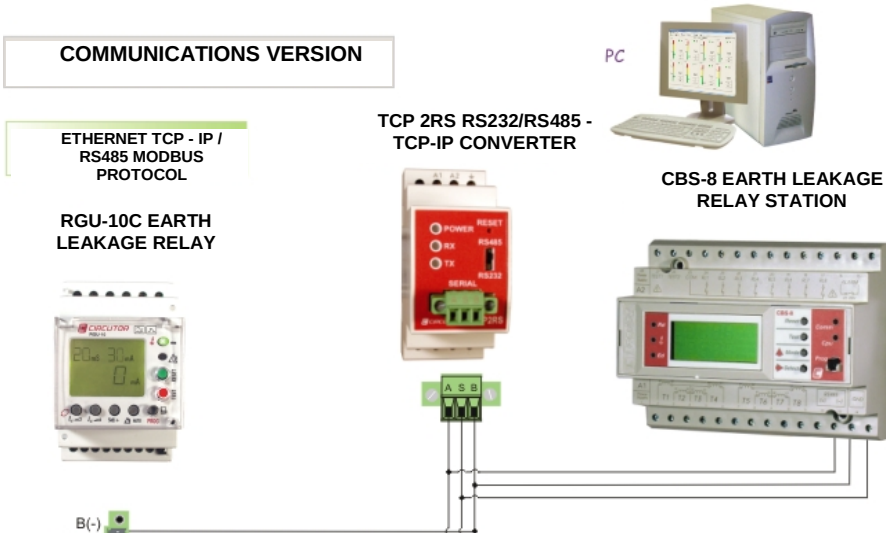
01	Peripheral number (1)
10	Modbus instruction number: multiple parameter writing (16)
00 00	Initial recording of writing (0)
00 05	Number of recordings to be changed (5)
00 0A	Frame CRC

Each Modbus frame has a maximum limit of 26 recordings

Connection for the RS485 BUS

The composition of the RS485 cabling must be carried out with a meshed screen cable (minimum 3 wire) with a maximum distance of 1,200 metres between the RGU-10C and the master unit. This Bus may connect a maximum of 32 series devices

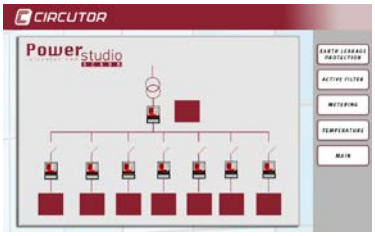




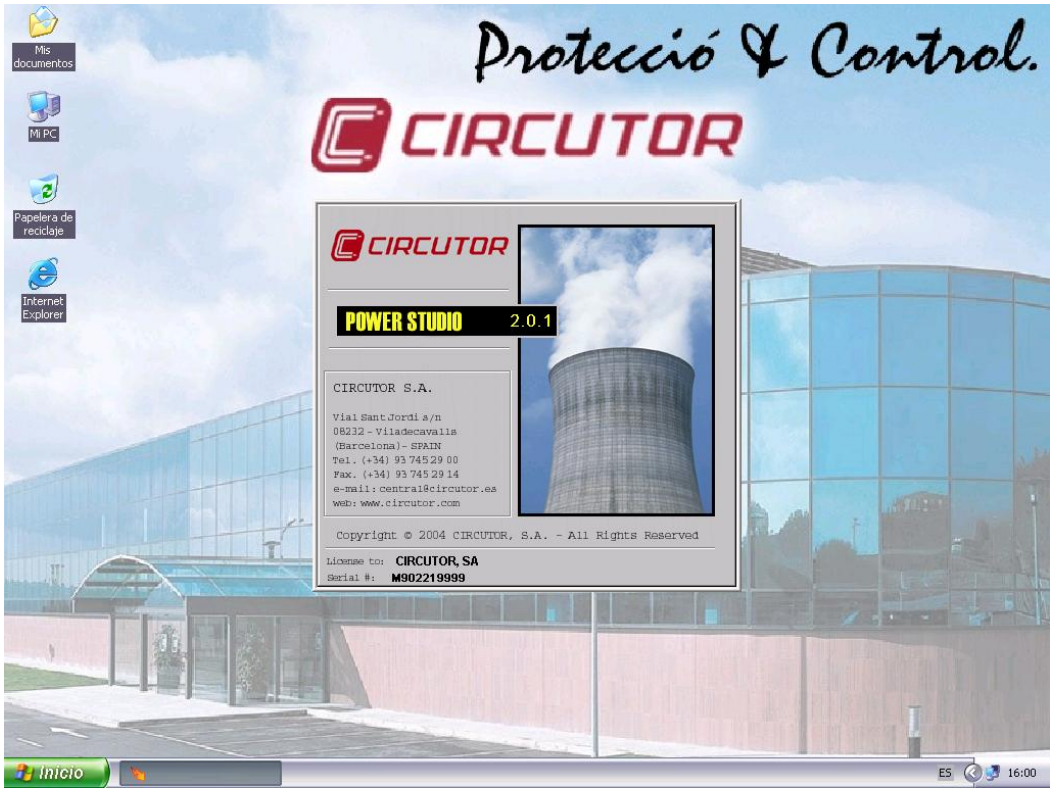
The following has to be used for communication with the master unit or PC:

1. The RS232 to RS485 System Protocol Intelligent Converter (*M54020* Intelligent Converter).
2. The TCP2RS Converter (*M54031*) of RS232/RS485 to Ethernet TCP/IP system protocol .

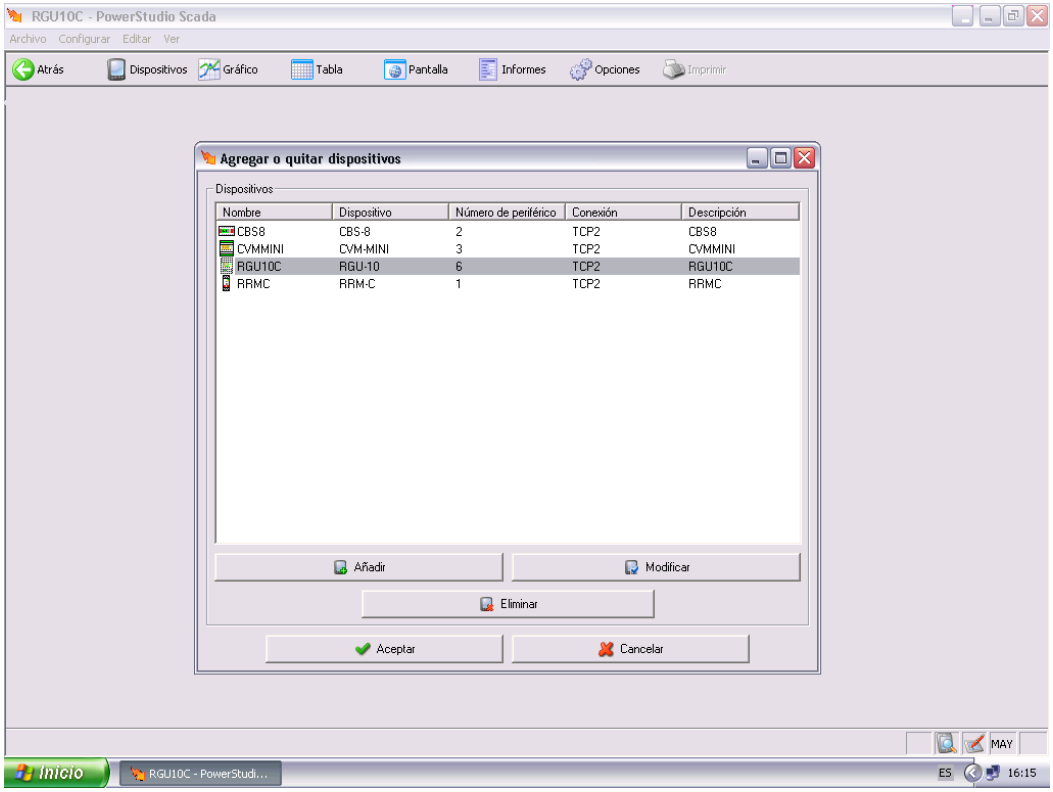
As well as the usual operation of each piece of equipment, this system may centralize data at one single point (*Power Studio*® System, *M90221).*

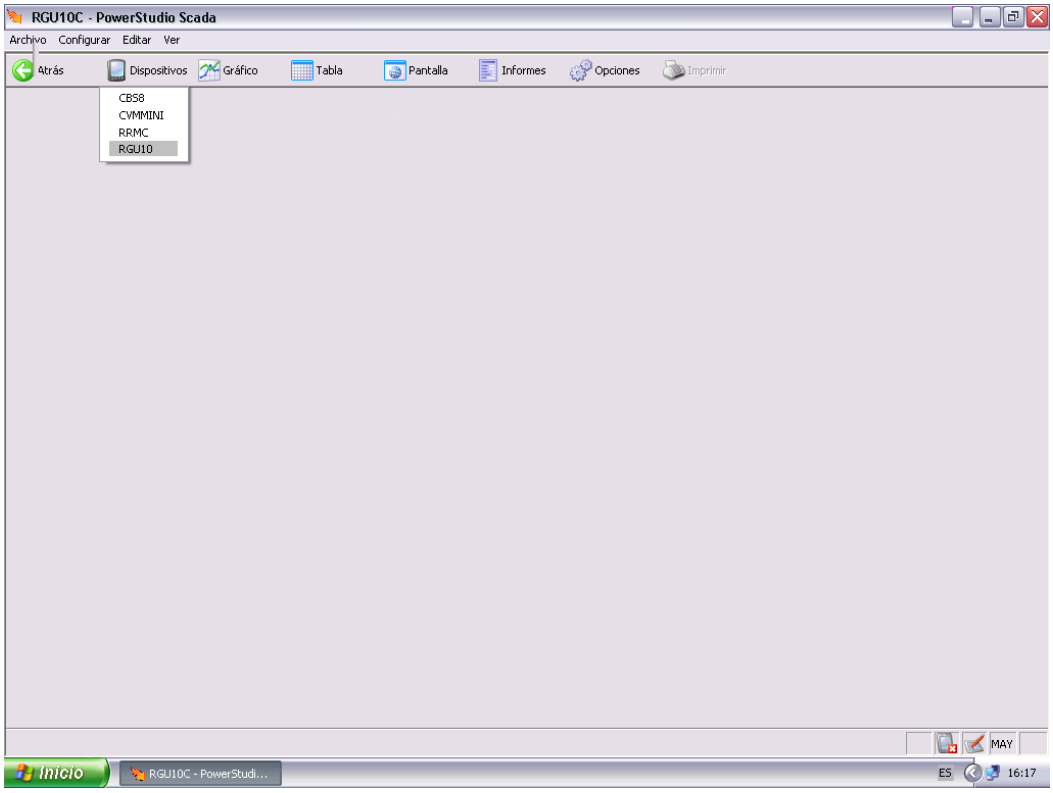


Different devices and RGU-10C's in the system can be monitored and set in the installation.

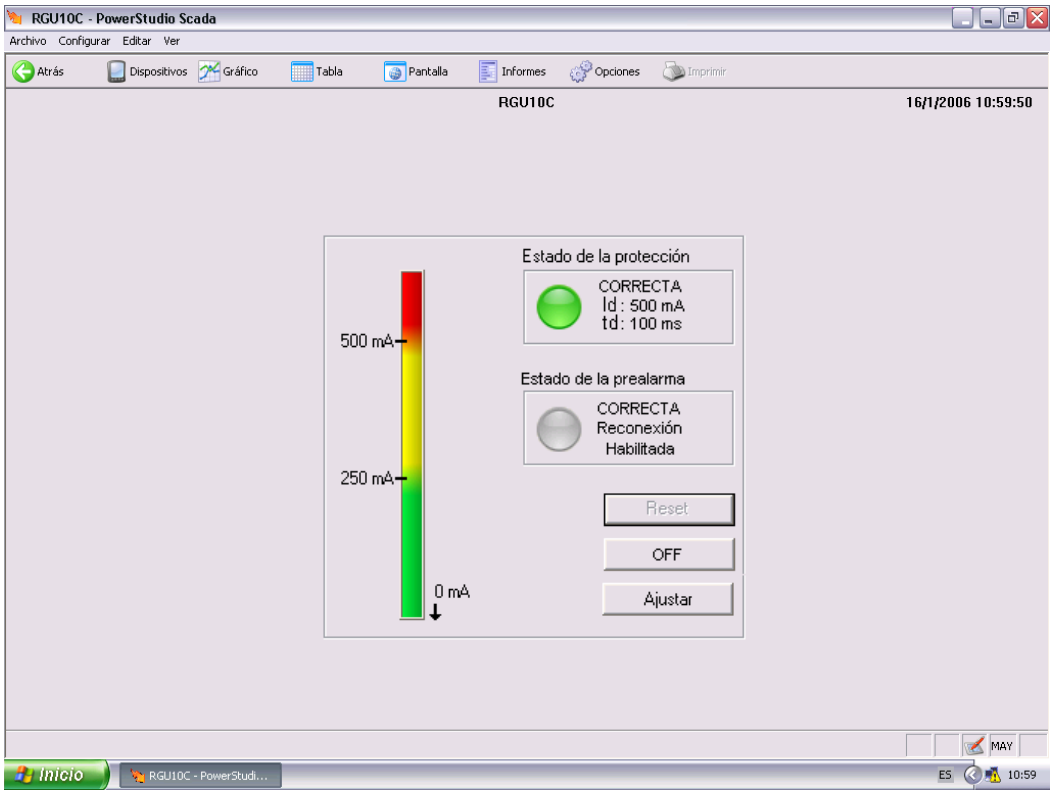


The system allows the easy setting of NETWORK communications

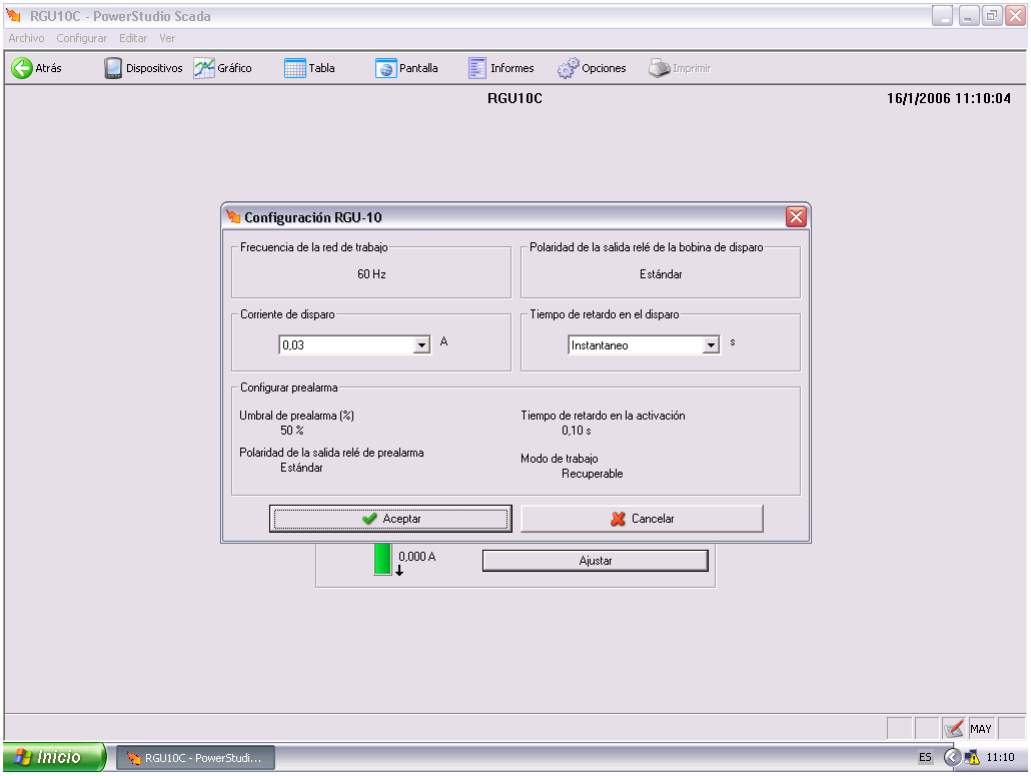


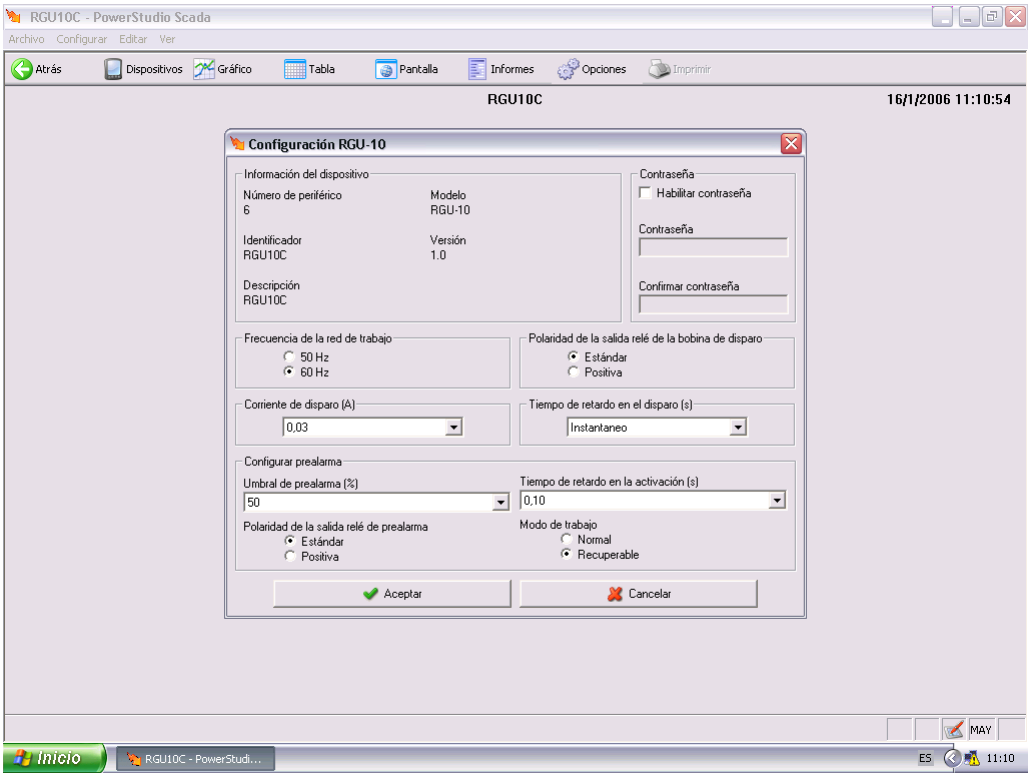


The operational status of the equipment can be observed from the PC.



All values that can be set from the equipment's keypad can be set from the PC.





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